Trend Study 17-58-05

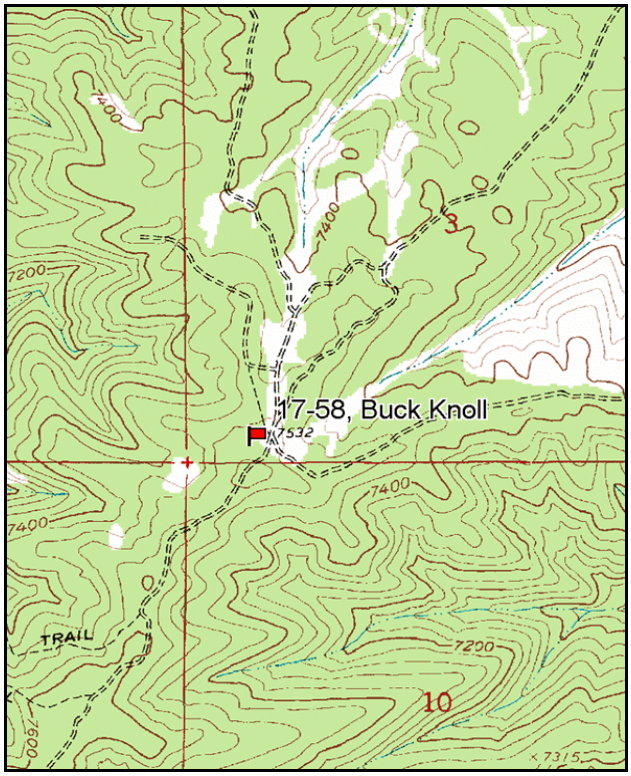
Study site name: Buck Knoll . Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 345 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

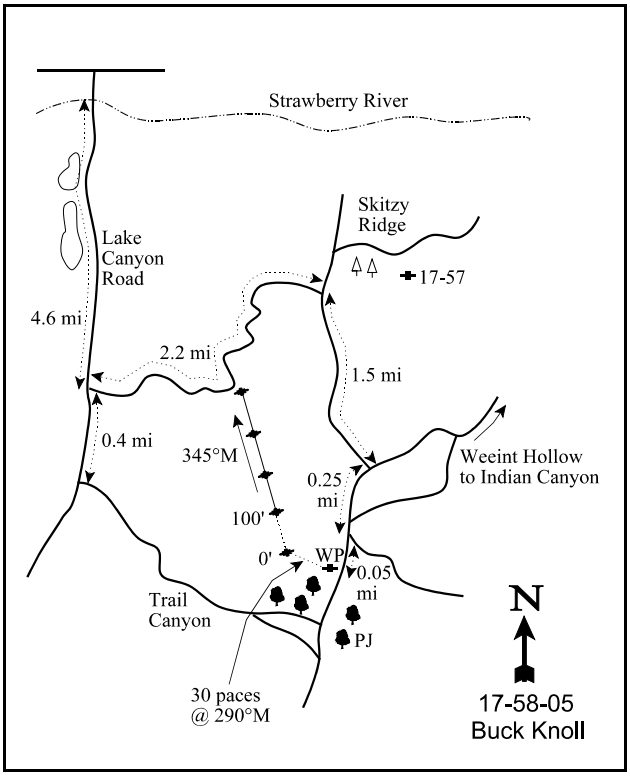
LOCATION DESCRIPTION

From the Strawberry River, take the Lake Canyon Road (3239 West) south for 4.6 miles to a road which goes up the side canyon to the east. Turn lest and go up the side canyon and switchbacks for 2.2 miles to an intersection at the top of the ridge (location of study 17-57). Turn right and drive south 1.5 miles to an intersection. Turn right and go 0.25 miles to a fork. Bear right and proceed up the hill 0.05 miles to the witness post, a short green fencepost on the right side of the road. From the witness post, the 0-foot baseline stake is 30 paces west (290°M) down the hill.



Map Name: Buck Knoll

Township 5S , Range 6W , Section 3



Diagrammatic Sketch

GPS: NAD 27, UTM 12T 4435267 N, 538193 E

DISCUSSION

Buck Knoll - Trend Study No. 17-58

The Buck Knoll range trend study is located in the Skitzy WMA on a Utah Division of Wildlife Resources chaining and seeding. It is approximately one and one-half miles southwest of study #17-57 at an elevation of 7,500 feet. It is close (within 100 yards) to the untreated juniper-pinyon woodland edge and is on a gentle (10% to 20%) west-facing slope. The area currently supports a mixed browse community with a good herbaceous understory. Pellet group data from 2000 were estimated at 26 elk, 6 deer, and 3 cow days use/acre (64 edu/ha, 15 ddu/ha, and 7 cdu/ha). In 2005, pellet group data estimates were 64 elk, 19 deer, and 5 cow days use/acre (157edu/ha, 46 ddu/ha, and 13 cdu/ha). Most pellet groups appeared to be from winter use during both readings.

The soil is relatively shallow with an effective rooting depth estimated at nearly 13 inches. The soil texture is a clay loam with a slightly alkaline soil reaction (pH of 7.4). Rock and pavement are common on the surface and in the soil profile. Many of the rocks in the profile contain calcium carbonate deposits. Phosphorus was measured at 5.1 ppm and values less than 6 ppm may limit normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). There is some localized soil movement but erosion is not severe. Regardless, the soil condition is still vastly better than in the nearby untreated juniper-pinyon woodland. The erosion index measurement in 2005 rated the degree of soil erosion as stable.

The browse is more abundant on this study area than at Skitzy Canyon (17-57), but it is still well below optimum for a deer winter range. The key species consist of a small stand of true mountain mahogany which has been estimated around 600 plants/acre since 1988. In 2005, the population experienced an increase to 800 plants/acre. Mahogany cover has gradually increased from 3% in 1995 to 5% cover in 2005. These shrubs are about 4 to 6½ feet in height and exhibit light to heavy utilization, depending on the year. It is evident from the pellet group and utilization data that big game wintering on the site differs from year to year. Vigor was good in 2005, but some plants had yellowing leaves in 2000 due to the very dry conditions. Secondary browse species provide additional forage, they include: black sagebrush, mountain big sagebrush, rubber rabbitbrush, antelope bitterbrush, and elderberry.

The herbaceous understory is dominated by a variety of grasses and has averaged 18% cover since 1995. The grass composition is similar to the Skitzy Canyon (17-57), but crested wheatgrass is not nearly as dominant. Crested wheatgrass only provided 4-5% cover from 1995 to 2005. Intermediate wheatgrass, Salina wildrye, Russian wildrye, and Indian ricegrass are also common. Forbs are diverse but not numerous. Twenty-eight species were encountered in 1995, combined they produced less than 3% cover. Twenty-two forbs were sampled in 2000 and 2005, which produced less than 1% total cover both years. The more common species are native species like hoary aster, mat penstemon, and common twinpod.

1982 APPARENT TREND ASSESSMENT

Soil condition is fair and improving as a result of increased herbaceous cover and litter accumulation since the chaining. The area is dominated by grasses, but contains a small number of desirable shrubs as well as an undesirable invader, broom snakeweed. Both can be expected to increase, although probably at different rates. Broom snakeweed could likely become more abundant in the immediate future.

1988 TREND ASSESSMENT

As was the case with study 17-57, this chained site shows little sign of change since 1982. Ground cover characteristics remain basically unchanged. Browse species are more prominent on this site than at Skitzy Canyon. Other than a slight increase in grass and forb frequency and shrub density, the data from the two

sampling periods is very similar. Observations based on photo point comparisons suggest an increase in the size of big sagebrush and less grass production in 1988. The expected rapid increase in broom snakeweed has not occurred because of the competitive herbaceous understory. The population of true mountain mahogany is mostly comprised of young plants (78%), but density has not significantly increased in the last six years. Use of the palatable browse species (mahogany, bitterbrush and mountain big sagebrush) is light.

TREND ASSESSMENT
soil - stable (0)
browse - slightly up (+1)
herbaceous understory - slightly up (+1)

1995 TREND ASSESSMENT

Ground cover characteristics are similar to those in 1988. Protective ground cover is good and erosion is not a problem. Browse trend is stable but density is still well below what would be needed for a good deer winter range. The herbaceous understory displays a stable trend with sum of nested frequency being slightly down for grasses but up for forbs. Grass composition has changed. Nested frequency of crested wheatgrass, intermediate wheatgrass, smooth brome and mutton bluegrass declined significantly while nested frequency of Russian wildrye, Indian ricegrass, bottlebrush squirreltail and needle-and-thread increased. The Desirable Components Index rated this site as fair with a score of 60 due to excellent perennial grass cover and excellent shrub decadence.

TREND ASSESSMENT
soil - stable (0)
browse - stable (0)
herbaceous understory - stable (0)
winter range condition (DC Index) - fair (60) Moderate Potential scale

2000 TREND ASSESSMENT

Trend for soil is considered stable. The slight changes do not warrant any changes in trend. Relative percent cover of bare ground has increased slightly while litter cover declined. In addition, the ratio of protective cover (vegetation, litter and cryptogams) to bare ground declined slightly. Sum of nested frequency for perennial grasses and forbs also decreased due to the dry conditions. There is some localized soil movement, but erosion is not a problem on the site at this time. Trend for browse is stable for the key species, true mountain mahogany. Density has remained similar to 1995, use is light to moderate and vigor normal. One positive aspect is that young recruitment has improved and numerous seedlings were sampled in 2000 (1,080 seedlings/acre). On the negative side, density of the green-stem rubber rabbitbrush, broom snakeweed and pinyon and juniper trees have increased. These less desirable shrubs and trees currently provide 45% of the browse cover. Trend for the herbaceous understory is down for grasses and forbs. Sum of nested frequency for perennial grasses has declined for crested wheatgrass, Indian ricegrass, bottlebrush squirreltail and needle-and-thread. The individual nested frequencies of Indian ricegrass, bottlebrush squirreltail, and needle-and-thread all decreased significantly. The only grass to increase significantly was Salina wildrye. Nested frequency of perennial forbs declined by 54% and cover dropped from 3% to less than 1%. The Desirable Components Index rated this site as good with a score of 69 due to excellent perennial grass cover, excellent percentage of young individuals, and excellent shrub decadence.

TREND ASSESSMENT
soil - stable (0)
browse - stable (0)
herbaceous understory - down (-2)
winter range condition (DC Index) - good (69) Moderate Potential scale

2005 TREND ASSESSMENT

The soil trend is slightly down. The ratio of protective ground cover (vegetation, litter and cryptogams) to bare ground decreased from 3.2:1 in 2000 to 2.7:1 in 2005, a 16% decrease. The relative cover of bare ground increased slightly and the relative cover of litter and vegetation both decreased slightly. The browse trend is up. Although densities are low, the preferred browse species true mountain mahogany, black sagebrush, and mountain big sagebrush all increased. The most important increase was that of mahogany, the key browse species, which increased 23%. Despite heavy use, mahogany shrubs were larger in height than they had been since the site was established in 1982. In the case of all three preferred browse species, decadence was low and vigor was good. The trend for herbaceous understory is stable. The sum of nested frequency for perennial grasses remained virtually unchanged while perennial forbs decreased. Perennial grasses are the more important herbaceous understory component on this winter range, therefore have a greater weight on the trend. Both perennial grass and forb percent cover increased slightly. The Desirable Components Index rated this site as fair to good with a score of 64 due to excellent perennial grass cover, a fair percentage of young individuals, and very low shrub decadence.

TREND ASSESSMENT
soil - slightly down (-1)
browse - up (+2)
herbaceous understory - stable (0)
winter range condition (DC Index) - fair to good (64) Moderate Potential scale

HERBACEOUS TRENDS --
Management unit 17 , Study no: 58

Type	Species	Nested Frequency				Average Cover %		
		'88	'95	'00	'05	'95	'00	'05
G	Agropyron cristatum	$_{c}$217	$_{b}$111	$_{ab}$94	$_{a}$71	5.14	3.99	4.88
G	Agropyron dasystachyum	8	11	16	5	.42	.25	.03
G	Agropyron intermedium	$_{b}$48	$_{a}$7	$_{ab}$29	$_{b}$39	.16	1.46	2.92
G	Bromus inermis	$_{b}$23	$_{a}$3	$_{a}$4	$_{a}$-	.03	.01	-
G	Carex sp.	$_{ab}$18	$_{b}$24	$_{a}$6	$_{ab}$8	.38	.21	.21
G	Elymus cinereus	11	8	1	5	.41	.38	.53
G	Elymus junceus	31	40	34	37	2.00	1.95	3.42
G	Elymus salina	$_{a}$47	$_{a}$38	$_{b}$89	$_{a}$35	1.82	4.09	1.83
G	Oryzopsis hymenoides	$_{a}$39	$_{b}$89	$_{a}$40	$_{a}$49	3.67	1.95	1.36
G	Poa fendleriana	$_{b}$33	$_{a}$9	$_{a}$13	$_{a}$11	.07	.39	.13
G	Poa pratensis	$_{a}$-	$_{b}$14	$_{ab}$7	$_{a}$-	.17	1.70	-
G	Poa secunda	$_{a}$-	$_{b}$24	$_{b}$12	$_{b}$28	.25	.07	.80

Type	Species	Nested Frequency				Average Cover %		
		'88	'95	'00	'05	'95	'00	'05
G	Sitanion hystrix	ab43	c83	a28	bc61	.61	.45	.99
G	Sporobolus cryptandrus	-	3	-	-	.00	-	-
G	Stipa comata	a8	b44	a14	b51	1.64	.65	2.33
G	Unknown grass - perennial	2	-	-	-	-	-	-
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		528	508	387	400	16.79	17.58	19.48
Total for Grasses		528	508	387	400	16.79	17.58	19.48
F	Agoseris glauca	-	-	-	-	.15	-	-
F	Antennaria rosea	-	-	7	2	-	.02	.01
F	Androsace septentrionalis (a)	-	b23	a2	a1	.10	.00	.00
F	Arabis drummondi	6	13	1	-	.02	.00	-
F	Arenaria fendleri	-	1	5	-	.00	.03	-
F	Astragalus argophyllus	13	8	2	3	.07	.00	.00
F	Astragalus miser	c35	bc17	a-	ab5	.24	-	.06
F	Balsamorhiza sagittata	1	-	-	-	-	-	-
F	Caulanthus crassicaulis	-	2	-	6	.00	-	.01
F	Calochortus nuttallii	-	2	-	-	.00	-	-
F	Chaenactis douglasii	a-	b18	a3	ab5	.04	.00	.05
F	Chenopodium fremontii (a)	-	b16	a-	b12	.06	-	.08
F	Chenopodium leptophyllum(a)	-	b10	a-	a-	.05	-	-
F	Chamaechaenactis scaposa	6	-	-	-	-	-	-
F	Cryptantha sp.	ab8	b19	a-	a-	.25	-	.00
F	Descurainia pinnata (a)	-	b29	a-	a5	.22	-	.02
F	Eriogonum alatum	a-	b17	ab7	ab10	.22	.02	.09
F	Erigeron eatonii	a-	a-	b10	a-	-	.07	-
F	Gilia sp. (a)	-	1	1	-	.00	.00	-
F	Hedysarum boreale	-	1	6	1	.03	.04	.15
F	Hymenoxys acaulis	b33	ab15	a1	a9	.08	.00	.05
F	Ipomopsis aggregata	a-	b12	ab1	ab1	.02	.00	.03
F	Lappula occidentalis (a)	-	b73	a3	b60	.52	.01	.43
F	Lesquerella sp.	b18	ab12	a3	a3	.04	.01	.00
F	Linum lewisii	b16	b14	b11	a-	.08	.10	-
F	Machaeranthera grindelioides	17	18	15	10	.32	.11	.24
F	Penstemon caespitosus	ab13	b31	a10	a3	.06	.10	.01
F	Physaria acutifolia	a-	ab10	b15	ab8	.04	.04	.16
F	Phlox sp.	b11	a-	a-	a-	-	-	-

Type	Species	Nested Frequency				Average Cover %		
		'88	'95	'00	'05	'95	'00	'05
F	Schoencrambe linifolia	-	4	-	-	.01	-	-
F	Senecio canus	11	4	3	2	.03	.01	.03
F	Sphaeralcea coccinea	-	1	4	-	.00	.15	-
F	Taraxacum officinale	$_{a}$-	$_{b}$13	$_{ab}$3	$_{ab}$2	.02	.01	.03
F	Townsendia incana	4	-	3	5	-	.03	.03
F	Tragopogon dubius	$_{a}$-	$_{b}$9	$_{a}$-	$_{a}$-	.02	-	-
F	Trifolium sp.	4	-	-	3	-	-	.00
Total for Annual Forbs		0	152	6	78	0.96	0.01	0.53
Total for Perennial Forbs		196	241	110	78	1.82	0.79	0.98
Total for Forbs		196	393	116	156	2.79	0.81	1.52

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 17 , Study no: 58

Type	Species	Average Cover %		
		'95	'00	'05
B	Amelanchier utahensis	-	-	-
B	Artemisia nova	-	-	.04
B	Artemisia tridentata vaseyana	.18	.76	.79
B	Cercocarpus montanus	3.10	4.49	4.90
B	Chrysothamnus nauseosus graveolens	2.04	1.63	1.86
B	Chrysothamnus nauseosus hololeucus	.56	1.12	-
B	Chrysothamnus viscidiflorus lanceolatus	-	.18	-
B	Eriogonum corymbosum	.15	.38	.38
B	Gutierrezia sarothrae	.53	.63	.42
B	Juniperus osteosperma	.56	.53	.78
B	Leptodactylon pungens	-	.03	-
B	Pinus edulis	1.16	3.05	.81
B	Purshia tridentata	-	.15	-
Total for Browse		8.31	12.97	9.98

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 17 , Study no: 58

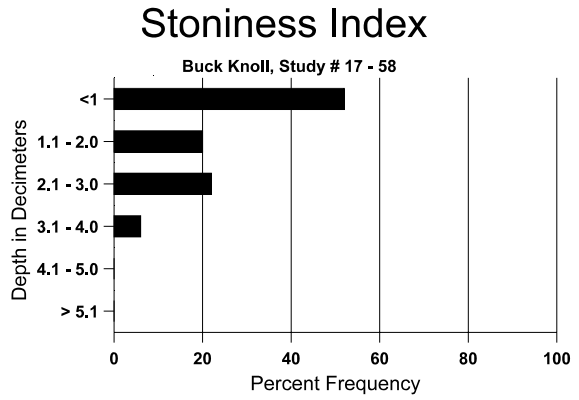
Species	Average leader growth (in) '05
Artemisia nova	1.6
Artemisia tridentata vaseyana	2.8
Cercocarpus montanus	3.6
Cowania mexicana	2.1

BASIC COVER --
Management unit 17 , Study no: 58

Cover Type	Average Cover %				
	'82	'88	'95	'00	'05
Vegetation	8.25	8.50	25.78	33.96	28.21
Rock	2.25	2.50	7.89	2.73	1.60
Pavement	18.00	18.25	8.38	11.82	11.38
Litter	57.50	59.00	55.12	54.79	45.62
Cryptogams	0	.25	.24	.22	.03
Bare Ground	14.00	11.50	10.93	14.94	26.13

SOIL ANALYSIS DATA --
Herd Unit 17, Study # 58, Study Name: Buck Knoll

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	ppm P	ppm K	dS/m
12.9	57.6 (15.7)	7.4	24.9	47.8	28.3	5.3	5.1	92.8	0.9



PELLET GROUP DATA --
Management unit 17 , Study no: 58

Type	Quadrat Frequency			Days use per acre (ha)	
	'95	'00	'05	'00	'05
Rabbit	5	16	13	-	-
Horse	5	1	-	-	-
Elk	12	18	27	26 (65)	64 (157)
Deer	7	9	9	6 (15)	19 (46)
Cattle	-	-	1	3 (7)	5 (13)

BROWSE CHARACTERISTICS --
Management unit 17 , Study no: 58

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia nova												
82	**0**	-	-	-	-	-	0	0	0	-	0	-/-
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
95	**40**	-	20	20	-	-	50	0	0	-	0	11/20
00	**0**	-	-	-	-	-	0	0	0	-	0	7/11
05	**320**	20	160	140	20	-	31	19	6	-	0	12/21
Artemisia tridentata vaseyana												
82	**66**	-	-	66	-	-	100	0	-	-	0	12/6
88	**66**	-	-	66	-	-	0	0	-	-	0	31/24
95	**40**	-	-	40	-	-	0	0	-	-	0	30/46
00	**100**	-	60	40	-	-	0	0	-	-	0	33/46
05	**160**	120	40	120	-	-	38	38	-	-	0	30/44
Atriplex canescens												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
00	**0**	-	-	-	-	-	0	0	-	-	0	-/-
05	**0**	-	-	-	-	-	0	0	-	-	0	11/29
Cercocarpus montanus												
82	**465**	66	333	66	66	-	29	71	14	-	14	25/33
88	**599**	-	466	133	-	-	0	0	0	-	0	44/53
95	**580**	-	80	500	-	20	62	17	0	-	0	47/49
00	**620**	1080	140	480	-	-	35	0	0	-	0	45/47
05	**800**	40	120	680	-	-	25	65	0	-	0	55/50

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus graveolens												
82	**0**	-	-	-	-	-	0	0	0	-	0	-/-
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
95	**780**	-	20	760	-	-	31	0	0	-	0	31/42
00	**1200**	20	360	580	260	-	0	0	22	10	10	23/29
05	**760**	20	80	600	80	20	0	0	11	5	5	29/36
Chrysothamnus nauseosus hololeucus												
82	**0**	-	-	-	-	-	0	0	0	-	0	-/-
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
95	**20**	-	-	20	-	-	0	0	0	-	0	28/26
00	**940**	-	300	620	20	-	0	0	2	-	0	4/5
05	**0**	-	-	-	-	-	0	0	0	-	0	32/29
Chrysothamnus viscidiflorus lanceolatus												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**133**	-	-	133	-	-	0	0	-	-	0	6/4
95	**120**	-	20	100	-	-	0	0	-	-	0	10/15
00	**180**	-	-	180	-	-	11	0	-	-	0	12/22
05	**0**	-	-	-	-	-	0	0	-	-	0	17/22
Cowania mexicana stansburiana												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
00	**0**	-	-	-	-	-	0	0	-	-	0	-/-
05	**0**	-	-	-	-	-	0	0	-	-	0	13/17
Ephedra viridis												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
00	**0**	-	-	-	-	-	0	0	-	-	0	21/40
05	**0**	-	-	-	-	-	0	0	-	-	0	14/22
Eriogonum corymbosum												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**60**	-	40	20	-	-	0	0	-	-	0	16/21
00	**40**	-	-	40	-	-	100	0	-	-	0	15/20
05	**60**	-	-	60	-	-	0	0	-	-	0	18/27

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae												
82	**600**	-	-	600	-	-	0	0	0	-	0	11/19
88	**2333**	-	-	2000	333	-	0	0	14	-	0	7/4
95	**1820**	280	780	1020	20	-	0	0	1	1	1	8/8
00	**2760**	20	200	2560	-	-	0	0	0	-	0	5/4
05	**2060**	160	560	1500	-	-	0	0	0	-	0	6/7
Juniperus osteosperma												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
00	**120**	-	100	20	-	-	0	0	-	-	0	-/-
05	**60**	-	40	20	-	20	0	0	-	-	0	-/-
Leptodactylon pungens												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
00	**20**	-	-	20	-	-	100	0	-	-	0	5/7
05	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Pinus edulis												
82	**66**	-	66	-	-	-	0	0	-	-	100	-/-
88	**66**	-	66	-	-	-	0	0	-	-	0	-/-
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
00	**120**	40	60	60	-	20	0	0	-	-	0	-/-
05	**120**	-	120	-	-	60	0	0	-	-	0	-/-
Purshia tridentata												
82	**66**	-	66	-	-	-	0	0	-	-	0	-/-
88	**66**	-	-	66	-	-	100	0	-	-	0	8/6
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
00	**20**	-	-	20	-	-	100	0	-	-	0	42/23
05	**20**	-	-	20	-	-	0	100	-	-	0	25/22
Sambucus cerulea												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**0**	-	-	-	-	-	0	0	-	-	0	61/64
00	**0**	-	-	-	-	-	0	0	-	-	0	46/53
05	**0**	-	-	-	-	-	0	0	-	-	0	58/67